DIRECT TESTIMONY AND EXHIBITS OF

BRANDON S. BICKLEY

ON BEHALF OF

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NO. 2020-1-E

IN RE: ANNUAL REVIEW OF BASE RATES FOR FUEL COSTS FOR DUKE ENERGY PROGRESS, LLC

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Brandon S. Bickley. My business address is 1401 Main Street, Suite 900, Columbia, South Carolina 29201. I am employed by the South Carolina Office of Regulatory Staff ("ORS") in the Energy Operations Division as a Regulatory Analyst.

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I received my Bachelor of Science Degree with a major in Mechanical Engineering from the University of South Carolina in 2010. From 2010 to 2013, I was employed as a Nuclear Engineer, Reactor Fuel Safety Officer, and Shift Refueling Engineer at Norfolk Naval Shipyard. In that capacity, I performed engineering and operational duties in support of the United States Navy related to reactor servicing, reactor fuel, special nuclear material, special nuclear projects, security, and safety. From 2013 to 2017, I was employed as an Inspections, Tests, Analyses, and Acceptance Criteria ("ITAAC") Engineer with South Carolina Electric & Gas Company ("SCE&G"). In that capacity, I performed ITAAC reviews and construction oversight for SCE&G. From 2017 to 2019, I was employed by Savannah River Remediation as a Senior Engineer. In that capacity, I performed systems

engineering duties in support of the Defense Waste Processing Facility for Savannah River Remediation. I began my employment with ORS as a Regulatory Analyst in July 2019.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA ("COMMISSION")?

A. Yes. I have previously testified before the Commission.

Q. WHAT IS THE MISSION OF THE OFFICE OF REGULATORY STAFF?

A. ORS represents the public interest as defined by the South Carolina General Assembly as follows:

> [T]he concerns of the using and consuming public with respect to public utility services, regardless of the class of customer, and preservation of continued investment in and maintenance of utility facilities so as to provide reliable and high-quality utility services.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to set forth ORS's recommendations resulting from its examination and review of Duke Energy Progress, LLC's ("DEP" or "Company") power plant operations used in the generation of electricity to meet the Company's retail customer requirements during the review period. The review period includes the actual data for March 1, 2019 through February 29, 2020 ("Actual Period"), estimated data for March 1, 2020 through June 30, 2020 ("Estimated Period"), and forecasted data for July 1, 2020 through June 30, 2021 ("Forecasted Period").

Q. WAS THE REVIEW PERFORMED BY YOU OR UNDER YOUR SUPERVISION?

A. Yes, the review to which I testify was performed by me or under my supervision.

Q. WHAT DID YOUR REVIEW OF THE COMPANY'S PLANT OPERATIONS INVOLVE?

A. ORS examined various fuel and performance related documents as part of its review. These documents address the Company's electric generation and power plant outage and maintenance activities. In preparation for this proceeding, ORS analyzed the Company's monthly fuel reports including power plant performance data, unit outages and generation statistics. ORS attended (via virtual participation) the April 29, 2020, Nuclear Regulatory Commission ("NRC") 2019 Annual Assessment Meeting for the Shearon Harris Nuclear Plant ("Harris") and the Brunswick Nuclear Plant ("Brunswick") and the May 13, 2020, NRC 2019 Annual Assessment Meeting for the Robinson Nuclear Plant ("Robinson"). ORS staff also attended a site visit at the Harris plant during the Actual Period.

Q. WHAT ADDITIONAL STEPS WERE TAKEN IN ORS'S REVIEW OF THE COMPANY'S PROPOSAL IN THIS PROCEEDING?

A. ORS met remotely with Company personnel from various departments to discuss and review the Company's electric generation, power plant outages and maintenance activities. In addition, ORS monitored electric generation statistics through industry and governmental publications.

Q. DID ORS EXAMINE THE COMPANY'S PLANT OPERATIONS FOR THE ACTUAL PERIOD?

A. Yes. ORS reviewed the performance of the Company's generation units to determine if the Company made reasonable efforts to maximize unit availability and minimize fuel costs. ORS also reviewed the operating statistics of the Company's power plants by unit. Exhibit BSB-1 shows, in percentages, the annual availability, capacity, and forced outage factors of the Company's major generation units during the Actual Period.

This exhibit also includes the North American Electric Reliability Corporation ("NERC") national five-year (2014-2018) averages for availability, capacity, and forced outage factors for each type of generation plant.

Q. PLEASE EXPLAIN HOW THE OUTAGES ARE REPRESENTED ON EXHIBITS BSB-2 THROUGH BSB-4.

A. Exhibits BSB-2 and BSB-3 summarize outages lasting seven (7) or more days for major coal and natural gas units during the Actual Period, respectively. While not all plant outages were included in these exhibits, all outages were reviewed and found to be reasonable by ORS. Exhibit BSB-4 shows the duration, type and cause of each outage for the nuclear units. During the Actual Period, there were two (2) scheduled refueling outages and six (6) forced outages. ORS reviewed the outages, including information and data provided by the Company as well as associated NRC documents, discussed the outages with Company management, and found the outages to be reasonable. The fleet of nuclear plants operated efficiently with an average availability factor of 91.21% and an average capacity factor of 91.74% during the Actual Period.

Q. WHAT WERE THE RESULTS OF YOUR ANALYSIS OF THE COMPANY'S POWER PLANT OPERATIONS FOR THE ACTUAL PERIOD?

A. ORS's review of the Company's operation of its generation facilities during the Actual Period revealed that the Company made reasonable efforts to maximize unit availability and minimize fuel costs.

Q. DID ORS REVIEW THE COMPANY'S GENERATION MIX DURING THE ACTUAL PERIOD?

A. Yes. Exhibit BSB-5 shows the generation mix for the Actual Period by percentage and generation type. As shown in this exhibit, the nuclear, coal, and natural gas plants contributed an average of 42.97%, 12.79% and 32.41%, respectively, of the Company's generation throughout the Actual Period. This equates to approximately 88.17% of the Company's generation for the Actual Period. The remainder of the generation was met through a mix of hydroelectric, renewables, purchased power, and Joint Dispatch Agreement ("JDA") purchases.

Q. DID ORS EXAMINE THE COMPANY'S FUEL COSTS ON A PLANT-BY-PLANT BASIS FOR THE ACTUAL PERIOD?

A. Yes. Exhibit BSB-6 shows the average fuel costs for the major generation plants on the Company's system for the Actual Period and the megawatt-hours ("MWh") produced by those plants. The chart shows the lowest average fuel cost of 0.571 cents/kilowatt-hour ("kWh") at the Robinson Plant and the highest average fuel cost of 4.243 cents/kWh at the Mayo Plant. The Company utilizes economic dispatch which generally requires that the lower cost units be dispatched first.

Q. DID ORS REVIEW THE COMPANY'S FORECASTED POWER PLANT OPERATIONS FOR THE ESTIMATED AND FORECASTED PERIODS?

A. Yes. ORS reviewed the Company's maintenance schedules and projected performance data for its power plants for the Estimated and Forecasted Periods. ORS compared these schedules to previous maintenance schedules from Docket No. 2019-1-E and found them to be reasonable.

Q. WILL YOU UPDATE YOUR DIRECT TESTIMONY BASED ON INFORMATION THAT BECOMES AVAILABLE?

A. Yes. ORS fully reserves the right to revise its recommendations via supplemental testimony should new information not previously provided by the Company, or other sources, become available.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

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Power Plant Performance Data

EXHIBIT BSB-1

Duke Energy Progress, LLC

Docket No. 2020-1-E

Coal Plants	Unit	MW Rating	*Actual Period Data* Average Availability Factor (%)	Average Capacity Factor (%)	Average Forced Outage Factor (%)
Asheville[1]	1	189	96.24	38.15	1.18
Asheville[1]	2	189	92.93	19.91	4.19
Mayo	1	727	86.22	20.12	1.04
Roxboro	1	379	72.64	16.33	0.10
Roxboro	2	668	81.74	22.57	0.14
Roxboro	3	694	76.30	37.26	0.00
Roxboro	4	698	85.10	38.98	0.00
Coal Totals		**3,544**	80.95	30.50	6.54
NERC 5-year average (All Coal Plants)			***83.00***	***54.69***	***5.09***

CC Plants[2]	Unit	MW Rating	Average Availability Factor (%)	Average Capacity Factor (%)	Average Forced Outage Factor (%)
Lee	CC1	888	90.22	71.81	0.23
Richmond	CC4	477	94.75	75.82	0.85
Richmond	CC5	597	78.70	66.52	0.46
Sutton	CC1	608	92.59	69.91	0.59
Asheville[3,4]	CC1	237	96.09	85.30	3.79
CC Totals		**2,807**	81.38	67.43	0.92
NERC 5-year average (CC Plants)			***87.91***	***53.59***	***2.34***

Nuclear Plants	Unit	MW Rating	Average Availability Factor (%)	Average Capacity Factor (%)	Average Forced Outage Factor (%)
Brunswick	1	938	93.51	93.73	6.23
Brunswick	2	932	87.87	86.53	3.83
Harris	1	964	89.73	90.16	0.00
Robinson	2	759	93.72	97.82	6.23
Nuclear Totals		**3,593**	91.21	91.74	3.97
NERC 5-year average (All Nuclear Plants)			***92.40***	***91.38***	***1.48***

[1] *Asheville Coal Units 1 and 2 Retired January 29, 2020*

[2] *CC designates Combined-Cycle units*

[3] *Asheville CC Unit 1: Commercial Operation Date for Power Block 1 - December 27, 2019*

[4] *Asheville CC Unit 2: Commercial Operation Date for Power Block 2 - April 4, 2020*

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EXHIBIT BSB-2

Coal Unit Outages - 7 Days or Greater Duration

Duke Energy Progress, LLC

Docket No. 2020-1-E

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Mayo 1	10/26/2019	11/14/2019	457.6	Maintenance	Unit taken offline for power control valve replacement during capital project outage.
Mayo 1	12/20/2019	12/30/2019	232.3	Maintenance	Unit taken offline to inspect/repair the secondary duct leaks and holes on both boilers.
Roxboro 1	5/6/2019	5/16/2019	241.0	Planned	Unit taken offline for scheduled outage (Repair Oil Leaks on A and C Main Bank Transformers).
Roxboro 1	8/31/2019	11/23/2019	2,016.0	Planned	Unit taken offline for scheduled outage (major boiler overhaul).
Roxboro 2	5/13/2019	6/1/2019	462.0	Planned	Unit taken offline for scheduled outage (burner repairs).
Roxboro 2	10/19/2019	11/2/2019	359.1	Maintenance	Unit taken offline for minor boiler overhaul.
Roxboro 2	11/20/2019	11/29/2019	236.8	Maintenance	Unit taken offline for expansion joint replacement, minor boiler overhaul.
Roxboro 3	3/13/2019	4/26/2019	474.7	Planned	Unit taken offline for scheduled outage (boiler inspections).
Roxboro 3	10/7/2019	10/27/2019	265.4	Maintenance	Unit taken offline for major boiler overhaul.
Roxboro 3	2/3/2020	2/14/2020	1,063.8	Maintenance	Unit taken offline for drain valve replacement.
Roxboro 4	4/26/2019	5/13/2019	404.5	Planned	Unit taken offline for scheduled generator exciter bearing outage.
Roxboro 4	5/13/2019	5/23/2019	230.0	Outage Extension	Unit taken offline for generator exciter bearing outage extension.
Roxboro 4	11/4/2019	11/23/2019	461.0	Maintenance	Unit taken offline for minor boiler overhaul.

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EXHIBIT BSB-3

Natural Gas Unit Outages - 7 Days or Greater Duration

Duke Energy Progress, LLC

Docket No. 2020-1-E

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Lee CC	5/3/2019	5/26/2019	531.3	Planned	Unit was taken offline for a planned outage.
Lee CC	10/26/2019	11/20/2019	615.5	Maintenance	Unit was taken offline to inspect and repair Bearings #3, #4, and #5
Richmond CC4	2/23/2019	3/9/2019	333.7	Planned	Unit was taken offline for a planned outage.
Richmond CC5	3/16/2019	5/25/2019	1,695.6	Planned	Unit was taken offline for a planned outage.
Sutton CC	4/13/2019	4/28/2019	374.1	Planned	Unit was taken offline for a planned outage.
Sutton CC	10/26/2019	11/3/2019	210.7	Planned	Unit was taken offline for a planned outage.

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Nuclear Unit Outages

Duke Energy Progress, LLC

Docket No. 2020-1-E

EXHIBIT BSB-4

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Brunswick 1	3/28/2019	4/11/2019	323.83	Forced	Unit forced offline due to drywell leak.
Brunswick 1	4/21/2019	4/27/2019	132.38	Forced	Unit forced offline due to false reactor high level indication.
Brunswick 1	9/5/2019	9/9/2019	91.03	Forced	Unit forced offline due to Hurricane Dorian.
Brunswick 2	3/2/2019	4/3/2019	767.00	Planned	Unit taken offline for scheduled refueling outage.
Brunswick 2	4/3/2019	4/13/2019	241.02	Forced	Unit forced offline due to failed instrument coupling on Unit 1.
Brunswick 2	9/5/2019	9/7/2019	55.95	Forced	Unit forced offline due to Hurricane Dorian.
Robinson 2	8/11/2019	9/3/2019	551.55	Forced	Unit forced offline due to generator exciter malfunction.
Harris 1	10/12/2019	11/18/2019	901.45	Planned	Unit taken offline for scheduled refueling outage.

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Generation Mix (Percentage)
Duke Energy Progress, LLC
Docket No. 2020-1-E

EXHIBIT BSB-5

	2019										2020		
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Average
Nuclear	40.18%	38.89%	53.02%	44.93%	40.39%	35.48%	36.14%	39.78%	44.75%	47.44%	49.01%	45.65%	**42.97%**
Coal	13.18%	7.14%	14.93%	14.47%	20.70%	18.22%	19.39%	12.63%	13.83%	12.17%	4.23%	2.66%	**12.79%**
Natural Gas	35.20%	32.22%	22.49%	30.19%	30.65%	31.82%	29.19%	32.53%	37.00%	32.38%	37.46%	37.75%	**32.41%**
Hydroelectric	1.68%	1.63%	1.29%	1.12%	0.63%	0.45%	0.21%	0.36%	0.69%	1.31%	1.53%	1.47%	**1.03%**
Solar	0.39%	0.51%	0.56%	0.45%	0.42%	0.38%	0.37%	0.34%	0.34%	0.26%	0.31%	0.28%	**0.39%**
Wind	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
Biomass	0.01%	0.01%	0.03%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.03%	0.03%	0.02%	**0.02%**
Purchased Power	5.43%	14.90%	2.37%	7.07%	5.52%	9.38%	12.52%	13.26%	1.61%	5.24%	6.68%	11.12%	**7.93%**
JDA Purchases	3.93%	4.70%	5.32%	1.75%	1.68%	4.26%	2.17%	1.08%	1.76%	1.17%	0.76%	1.04%	**2.47%**

Average total may not equal 100% due to rounding.

Office of Regulatory Staff
Generation Statistics for Plants
Duke Energy Progress, LLC
Docket No. 2020-1-E

EXHIBIT BSB-6

Plant	Fuel Type	Average Fuel Cost (Cents/kWh) [1]	Generation (MWh)
Robinson	Nuclear	0.571	6,392,460
Brunswick	Nuclear	0.609	14,806,584
Harris	Nuclear	0.652	7,634,599
Lee CC	Natural Gas	2.742	6,680,369
Richmond CC	Natural Gas	3.080	7,779,338
Sutton CC	Natural Gas	3.166	4,415,099
Asheville CC	Natural Gas	3.291	509,530
Roxboro	Coal	3.878	6,608,429
Asheville	Coal	4.190	902,379
Mayo	Coal	4.243	1,325,865

[1] ***Includes Base Fuel and Environmental Costs.***